AMENDMENTS TO THE CLAIMS

Please amend the claims as shown below.

1. (Twice amended) A mutant prenyl diphosphate synthase having a modified amino acid sequence, wherein

said mutant diphosphate synthase comprises an aspartic acid-rich domain having the sequence, $D_1D_2X_1X_2(X_3X_4)D_3$, in region II of said mutant prenyl diphosphate synthase,

wherein each of D_1, D_2, and D_3 denote an aspartic acid residue; X_1, X_2 , X_3, and X_4 are each independently any amino acid and X_3 and X_4 are each optionally independently present in the aspartic acid rich domain, and wherein

said mutant prenyl disphosphate synthase comprises (1) at least one amino acid substitution, said at least one amino acid substitution located at at least one amino acid position selected from (a) an amino acid between D_1 and the amino acid residue at the fifth position upstream of D_1 and (b) the amino acid residue located one amino acid [positions] position upstream of D_3; (2) at least one additional amino acid inserted between D_3 and the first amino acid upstream of D_3; or (3) a combination of (1) and (2);

wherein said mutant prenyl diphosphate synthase synthesizes [prenyl] farnesyl diphosphate which is shorter than prenyl diphosphate synthesized by a corresponding wild-type prenyl diphosphate synthase [enzyme].

2. (Amended) A mutant prenyl [diphospate] diphosphate synthase according to claim 1 wherein said mutant has the [enzymatic activities and] thermo stability of wild type prenyl diphosphate synthase and an enzymatic activity in the synthesis of prenyl diphosphate.

3. (Original) A mutant enzyme according to claim 1 wherein the reaction product of the prenyl diphosphate synthase is farnesyl diphosphate.

4. (Amended) A mutant enzyme according to claim 1 wherein the prenyl diphosphate synthase is [on the homodimer-type] a homodimer.

5. (Amended) A mutant enzyme according to claim 1 wherein the prenyl diphosphate synthase is [derived from] an archaea prenyl diphosphate synthase.

6. (Amended) A mutant enzyme according to claim 1 wherein the prenyl diphosphate synthase is [derived from] *Sulfolobus acidocaldarius* prenyl diphosphate synthase.

7. (Amended) A mutant enzyme according to claim 1 wherein the prenyl diphosphate synthase is [a] more thermostable than corresponding wild-type prenyl diphosphate synthase [enzyme].

8. (Amended) A mutant prenyl diphosphate synthase according to claim 1, wherein at least one amino acid selected from phenylalanine at position 77, threonine at position 78, valine at position 80, and histidine at position 81[, and isoleucine at position 84] has been substituted by another amino acid, or one or more amino acids have been inserted in between isoleucine at position 84 and methionine at position 85 in the geranylgeranyl diphosphate synthase as set forth in [SEQ ID No:1] SEQ ID NO:1.

9. (Amended) A mutant prenyl diphosphate synthase according to claim 1 wherein at least one amino acid selected from phenylalanine at position 77, threonine at position 78, valine at position 80, and histidine at position 81[, and isoleucine at position 84] has been substituted by another amino acid, and/or two amino acids have been inserted between isoleucine at position 84 and methionine at position 85 in the geranylgeranyl diphosphate synthase as set forth in [SEQ ID No: 1] SEQ ID NO:1, wherein the phenyl alanine at position 77 has been replaced with tyrosine, the threonine at position 78 has been replaced with phenylalanine or serine, the valine at position 80 has been replaced with isoleucine, or the histidine at position 81 has been replaced with leucine or alanine[, or the isoleucine at position 84 has been replace with leucine]; or proline and serine have been inserted in between the isoleucine at position 84 and the methionine at position 85.

10. (Original) A mutant prenyl diphosphate synthase according to claim 1, wherein the mutant prenyl diphosphate synthase is derived from a native geranylgeranyl diphosphate synthase of an organism selected from the group consisting of *Arabidopsis thaliana, Lupinas albus, Capsicum annuum, Sulfolobus acidocaldarius, Rhodobactor sphaeroides, Rhodobacter capsulatus, Erwinia herbicola, Myxococcus thaliana and Neurospora crassa.*

11. (Amended) A DNA encoding an enzyme according to claim [1] 8 or 9.

12. (Original) An RNA transcribed from a DNA according to claim 11.

13. (Original) A recombinant vector comprising a DNA according to claim 11.

14. (Original) A host organism transformed with a recombinant vector according to claim 13.

15. (Original) A process for producing a mutant enzyme according to claim 1, said method comprising the steps of culturing a host transformed with an expression vector comprising of a DNA coding for the mutant enzyme and of harvesting the expression product from the culture.

16. (Amended) A process for producing a prenyl diphosphate having not more than 15 carbons comprising the step of bringing an enzyme according to any one of claims [claim] 1 [or any of claims 2] to 10 or an enzyme produced by the method according to claim 15 into contact with a substrate selected from the group consisting of isopentenyl diphosphate, dimethylallyl diphosphate, and geranyl diphosphate.

[19] 17. (Amended) A mutant prenyl diphosphate synthase having a modified amino acid sequence, wherein

said mutant diphosphate synthase comprises an aspartic acid-rich domain having the sequence, $D_1D_2X_1(X_2X_3)X_4D_3$, in region II of said mutant prenyl diphosphate synthase,

wherein each of D_1, D_2, and D_3 denote an aspartic acid residue; X_1, X_2, X_3, and X_4 are each independently any amino acid [and X_2 and X_3 are each optionally independently present in the aspartic acid rich domain], and wherein

said mutant prenyl disphosphate synthase comprises (1) at least one amino acid substitution, said at least one amino acid substitution located at <u>at</u> least one amino acid position selected from (a) an amino acid between D_1 and the amino acid residue at the fifth position upstream of D_1 and (b) the amino acid residue located one amino acid position downstream of D_2; (2) at least one additional amino acid inserted between the first amino acid downstream of D_2 and the first amino acid upstream of D_3; or (3) a combination of (1) and (2);

wherein said mutant prenyl diphosphate synthase synthesizes [prenyl] <u>farnesyl</u> diphosphate which is shorter than prenyl diphosphate synthesized by a corresponding wild-type <u>prenyl diphosphate synthase</u> [enzyme].

[20] <u>18</u>. (Amended) A mutant prenyl [diphospate] <u>diphosphate</u> synthase according to claim [19] <u>17</u> wherein said mutant has the [enzymatic activities and] thermostability of wild type prenyl diphosphate synthase <u>and an enzymatic activity in the synthesis of prenyl diphosphate</u>.

[21] <u>19</u>. (Amended) A mutant enzyme according to claim [19] <u>17</u> wherein the reaction product of the prenyl diphosphate synthase is farnesyl diphosphate.

[22] <u>20</u>. (Amended) A mutant enzyme according to claim [19] <u>17</u> wherein the prenyl diphosphate synthase is a homodimer.

[23] 21. (Amended) A mutant enzyme according to claim [19] 17 wherein the prenyl diphosphate synthase is [derived from] an archaea prenyl diphosphate synthase.

[24] 22. (Amended) A mutant enzyme according to claim [19] 17 wherein the prenyl diphosphate synthase is [derived from] *Sulfolobus acidocaldarius* prenyl diphosphate synthase.

[25] 23. (Amended) A mutant enzyme according to claim [19] 17 wherein the prenyl diphosphate synthase is [a] more thermostable than corresponding wild-type prenyl diphosphate synthase [enzyme].

[26] 24. (Amended) A mutant prenyl diphosphate synthase according to claim [19] 17, wherein at least one amino acid selected from phenylalanine at position 77, threonine at position 78, valine at position 80, histidine at position 81, and isoleucine at position 84 has been substituted by another amino acid, or one or more amino acids have been inserted in between isoleucine at position 84 and methionine at position 85 in the geranylgeranyl diphosphate synthase as set forth in [SEQ ID No:1] SEQ ID NO:1.

[27] 25. (Amended) A mutant prenyl diphosphate synthase according to claim [19] 17 wherein at least one amino acid selected from phenylalanine at position 77, threonine at position 78, valine at position 80, histidine at position 81, and isoleucine at position 84 has been substituted by another amino acid, and/or two amino acids have been inserted between isoleucine at position 84 and methionine at position 85 in the geranylgeranyl diphosphate synthase as set forth in [SEQ ID No: 1] SEQ ID NO:1, wherein the phenyl alanine at position 77 has been replaced with tyrosine, the threonine at position 78 has been replaced with phenylalanine or serine, the valine at position 80 has been replaced with isoleucine, the histidine at position 81 has been replaced with leucine or alanine, or the isoleucine at position 84 has been replaced with leucine; or proline and serine have been inserted in between the isoleucine at position 84 and the methionine at position 85.

[28] 26. (Amended) A mutant prenyl diphosphate synthase according to claim [19] 17, wherein the mutant prenyl diphosphate synthase is derived from a native geranylgeranyl diphosphate synthase of an organism selected from the group consisting of *Arabidopsis thaliana, Lupinas albus, Capsicum annuum, Sulfolobus acidocaldarius, Rhodobactor sphaeroides, Rhodobacter capsulatus, Erwinia herbicola, Myxococcus thaliana and Neurospora crassa.*

[29] 27. (Amended) A DNA encoding an enzyme according to claim [19] 24 or 25.

[30] 28. (Amended) An RNA transcribed from a DNA according to claim [29] 27.

[31] 29. (Amended) A recombinant vector comprising a DNA according to claim [29] 27.

[32] 30. (Amended) A host organism transformed with a recombinant vector according to claim [31] 29.

[33] 31. (Amended) A process for producing a mutant enzyme according to claim [19] 17, said method comprising the steps of culturing a host transformed with an expression vector comprising a DNA coding for the mutant enzyme and harvesting the expression product from the culture.

[34] 32. (Amended) A process for producing a prenyl diphosphate having not more than 15 carbons comprising the step of bringing an enzyme according to claim [19] 17 into contact with a substrate selected from the group consisting of isopentenyl diphosphate, dimethylallyl diphosphate, and geranyl diphosphate.